Section 7-02 -- Clear Zone Concept

7-02.1 Introduction

An area clear of fixed objects adjacent to the roadway is desirable to provide a recovery zone for vehicles that have left the traveled way. Studies have indicated that on high-speed highways, a clear width of 30 feet from the edge of the traveled way permits about 80 percent of the vehicles leaving the roadway out of control to recover. Therefore, 30 feet should be considered the minimum, traversable clear recovery area for freeways and high-speed expressways. High-speed is defined as operating speeds greater than 45 mph.

On most conventional highways, a 30-foot clear zone distance may be difficult to justify for engineering, environmental or economic reasons. For these reasons, a minimum, traversable clear recovery area of 20 feet on conventional highways is advised. The designer must keep in mind that site-specific conditions such as volume, speed, alignment, side slope, weather, adjacent development, and environmental conditions should be evaluated when determining the clear recovery zone. Obstacles located in the clear recovery zone should be removed, relocated, made breakaway, or shielded by guardrail or crash cushions where justified in accordance with the following guidelines.

Additional information regarding this subject is available in the *Roadside Design Guide*, American Association of State Highway and Transportation Officials (AASHTO), and the Caltrans *Highway Design Manual*.

7-02.2 Remove/Relocate the Obstacle

There are several locations where a fixed object can be relocated from the clear recovery zone. By order of preference, they are:

1. Remove it if practicable.
2. Move it to a location where it is unlikely to be hit, such as up a slope or behind a guardrail or wall that is required for other reasons.
3. Relocate it far enough from the traveled way to minimize its chances of being struck. Non-traversable ditches, drainage structures, columns, utility poles, and overhead sign structures may be handled by this method.
4. Relocate an obstacle in the median or gore to a location beyond the right shoulder, thereby reducing the risk of exposure to at least one direction of travel.

7-02.3 Make the Obstacle Breakaway

If fixed objects such as light standards and ground-mounted sign supports cannot be moved out of the clear recovery zone, they should be considered for breakaway treatment.

The standard breakaway support for light standards is a three-point triangular slip-base, see Standard Plans for details. All light standards within the clear recovery zone located where they can be struck by a vehicle should have a slip-base, except where pedestrians might be struck by the falling standard or it could conflict with traffic.

The laminated wood box beam is the standard breakaway support system for large ground-mounted signs. Laminated wood box beam posts have replaced large timber poles for new installations.

Intermediate size ground-mounted signs may be mounted on dimensioned wood posts. Any sign post 4-inches x 6-inches or larger should be drilled to make it breakaway. Details for the size and location of the holes are contained in the Standard Plans.

Small ground-mounted signs may be supported on dimensioned wood posts or approved commercially available yielding steel supports. Contact your District Traffic Safety Systems Coordinator for information regarding commercially available yielding steel supports.

Mailboxes should be mounted on wood posts no larger than 4-inches x 4-inches or steel pipe no larger than 2 inches in diameter. Spacing between multiple mailbox posts shall be at least 3/4 the height of the post. Multiple mailboxes

should never be mounted on a longitudinal rail within the clear recovery zone. There is a commercially available yielding mailbox support system that will accommodate up to four mailboxes. The cluster mailboxes installed by the U.S. Postal Service do not perform acceptably on impact and should not be installed in the clear recovery zone beside high-speed highways. For more information on mailbox support design and placement, see the *Roadside Design Guide*, Chapter 11, "Erecting Mailboxes on Streets and Highways". Contact Headquarters Office of Traffic Safety Program for approval before the use of non-standard mailbox support design.

Call boxes and chain control signs on steel posts should be mounted on slip-bases where appropriate. Other features in the vicinity should not impede the function of the breakaway device or adversely influence the vehicle response.

7-02.4 Shield the Obstacle

If it is not practical to eliminate, relocate, or make a fixed object break away, then the object should be shielded. All the systems available to shield fixed objects are also fixed objects. They do not prevent an accident but are intended to reduce the severity of the accident. Longitudinal barriers such as guardrail, median barrier, and bridge railing are designed to redirect a vehicle away from its errant path. These barriers have been tested for structural integrity and occupant risk.

Crash cushions are designed to safely decelerate a passenger vehicle to a stop in head-on impacts. When a vehicle strikes the cushions, it expends its kinetic energy by compressing a hydraulic cylinder, compressing or crushing material, tearing metal, displacing sand, or moving a metal cable or strap through a restricted path. Crash cushions are generally used to shield relatively narrow objects such as piers, columns, overhead sign supports, and median barrier installations. A list of approved crash cushions may be obtained from your District Traffic Safety Devices Coordinator, Headquarters' Traffic Operations Liaison or Headquarters' Office of Traffic Safety Program.

Section 7-03 -- Guardrail

7-03.1 Introduction

Guardrail, also referred to as guiderail, is the most common traffic safety system found on California State highways. Guardrail is installed to reduce the severity of run-off-road accidents. This is accomplished by redirecting a vehicle away from embankment slopes or fixed objects and dissipating the energy of the errant vehicle. However, guardrail can reduce accident severity only for those conditions where striking the guardrail is less severe than going down an embankment or striking a fixed object. Guardrail should only be installed where it is clear that accident severity will be reduced, or there is a history of run-off-the-road accidents at this location.

Consideration should first be given to eliminating or minimizing conditions requiring guardrail. This can be done by flattening embankment slopes and by determining alternative locations and designs of roadside appurtenances.

Special consideration should be given to eliminating or relocating solitary fixed objects that cannot be made breakaway or yielding. The cost of eliminating the object may be offset by savings from reduced collision frequency and reduced maintenance. Guardrail required to provide protection at such objects increases exposure and may result in an increase in the number of accidents.

Guardrail is not intended to and should not be used as a barricade or to prevent indiscriminate use of otherwise clear portions of the roadside.